

REMARKS

Claims 1-5, all the claims pending in the application, stand rejected. Claim 1 is amended. Claim 5 is cancelled. New claims 6 and 7 are added.

Amended claim 1 is clearly supported by the description of page 8, lines 14-24 of the originally filed specification. New claim 6 is clearly supported by the description of page 10, line 23 to page 11, line 5 of the originally filed specification. New claim 7 is clearly supported by the description of page 9, lines 11-13 of the originally filed specification.

Claim Rejections - 35 USC § 103

Claims 1-2 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakaguchi et al (U.S. 2002/0064606) in view of Veerasamy et al (U.S. Patent 5,858,477). This rejection is traversed for at least the following reasons.

Claim 1

With respect to independent claim 1, the Examiner asserts that Sakaguchi et al teaches all of the claimed steps, but for the exclusion of hydrogen gas from the mixed gases. The Examiner looks to Veerasamy et al for the use of an acetylene - nitrogen system to deposit diamond-like carbon layers using P-CVD over magnetic recording media films, specifically, column 18 lines 12 - 53 for the acetylene - nitrogen system and column 11, lines 20-32 for the teaching that nitrogen may be continuously fed with the acetylene to nitrogenate the resultant diamond-like carbon film.

Features Of The Invention

The object of the present invention is to obtain the excellent LUL durability by preventing occurrence of the particles in the magnetic disk apparatus of the load/ unload system.

Particularly, in the magnetic disk apparatus of the load/ unload system, if the strength of the protection layer is insufficient, there is a specific problem wherein a small flaw or the like is produced on the surface of the magnetic disk by the impact of the magnetic head and a readout signal is reduced in signal level.

In order to solve this specific problem, according to the present invention, in the method of producing the magnetic disk for use in the magnetic disk apparatus of the load/ unload system,

a mixed gas of the hydrocarbon-based gas and the nitrogen gas, which does not contain an inactive gas, is used so that production of an organic polymer compound that causes the particles is suppressed. Consequently, the strength of the protection layer can be improved and an excellent LUL durability can be obtained.

Specifically, according to the present invention as now defined in amended claim 1, there is a method of producing a magnetic disk for use in a magnetic disk apparatus of a load/ unload system, comprising:

forming at least a magnetic layer on a disk substrate, and
thereafter forming a carbon-based protection layer by plasma CVD using a mixed gas of a hydrocarbon-based gas and a nitrogen gas without containing an inactive gas under the condition that the disk substrate with the magnetic layer formed thereon is kept at a temperature higher than 200°C,

wherein a content of the nitrogen gas with respect to the hydrocarbon-based gas falls within a range between 0.5% and 6%. These important features of the present invention are not found in the prior art.

Deficiencies in the Prior Art

Sakaguchi et al

Sakaguchi relates to a method of producing a magnetic disk of the CSS system-type and discloses the method of forming the carbon protective film on the magnetic film by plasma CVD using the mixed gas of toluene and hydrogen.

However, since Sakaguchi relates to the method of producing the magnetic disk of the CSS system-type, Sakaguchi fails to disclose or suggest not only the above-mentioned problem specific to the load/ unload system, but also the particular features of the present invention.

Use of Inactive Gas

In particular, although Sakaguchi discloses using the mixed gas of hydrocarbon and hydrogen, Sakaguchi fails to teach the mixed gas without containing the inactive gas.

Specifically, Sakaguchi discloses “The sputter gas used for forming a spatter carbon layer according to the spatter-coating method is preferably argon, into which at least one gas selected

from among nitrogen, hydrogen, and methane, is added at a mixing ratio to the argon of 0.1-100% by volume” at [0034]. Thus, Sakaguchi discloses using the inactive gas (argon) as the mixed gas.

In general, in case where a person in the art uses the mixed gas of toluene and hydrogen as described in Sakaguchi, since 100% hydrogen is extremely dangerous, hydrogen diluted with argon (the inactive gas) at a certain degree is used. In this case, for example, a gas bottle containing 100% toluene and a gas bottle containing argon and hydrogen are used.

No Gas in Recited Range

Moreover, according to the present invention, a content of the nitrogen gas with respect to the hydrocarbon-based gas falls within a range between 0.5% and 6%, as recited in the amended claim 1.

As described at page 8, lines 14-24 of the original specification, the nitrogen gas being contained in the above-mentioned range suppresses the production of particles causing the thermal asperity so that the carbon-based protection layer excellent in LUL durability can be obtained. If the content of the nitrogen gas with respect to the hydrocarbon-based gas exceeds 6%, the particle suppressing effect is obtained but the amount of a graphite component in the protection layer may be increased to deteriorate the LUL durability. On the other hand, if the content of the nitrogen gas with respect to the hydrocarbon-based gas is smaller than 0.5%, the particle suppressing effect may be insufficient. In sum, Sakaguchi fails to disclose this feature and such feature would not be obvious from the teachings of Sakaguchi as it teaches in an opposite direction.

Veerasamy et al

Applicants respectfully submit that Veerasamy also fails to disclose or teach the above-mentioned features of the present invention.

As discussed above, the cited references fail to disclose or suggest the features of the present invention as set forth in claim 1. Accordingly, the present invention is patentable over the combination of the cited references.

Claims 2 and 5

With respect to claims 2 and 5, the claims are patentable at least due to their dependency from claim 1.

Claims 3-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakaguchi et al (U.S. 2002/0064606) in view of Veerasamy et al (5,858,477), and further in view of Suzuki et al (6,680,112). This rejection is traversed for at least the following reasons.

As already demonstrated, the combination of Sakaguchi et al and Veerasamy et al do not teach essential elements of the present invention as defined in amended claim 1.

Claim 3

Further, the Examiner admits that Sakaguchi et al and Veerasamy et al do not teach the limitation of Claim 3, which specifies that the method of claim 1 further comprises exposing the carbon-based protective layer to nitrogen plasma after forming the carbon-based protection layer. The Examiner looks to Suzuki et al solely for the feature that using an etching gas, wherein nitrogen is explicitly cited as a valid example among other gases that can generate a plasma (Column 5 Lines 16-29), allows for controlling the affinity of the DLC film to a lubricant film (Column 4 Lines 21-45, 50-56), promoting adhesion of the lubricant film to the DLC film.

The Examiner takes the position that the invention of Claim 3 is “suitable for use in a CSS system.” The Examiner asserts that the selection of something based on its known suitability for its intended use has been held to support a prima facie case of obviousness, citing Sinclair & Carroll Co. v. Interchemical Corp., U.S. 327, 65 USPQ 297 (1945), and that it would have been obvious to one of ordinary skill in the art at the time the invention was made to have applied the plasma-etching step of Suzuki et al to the selected method of Sakaguchi et al because Sakaguchi et al teaches a lubricating film, Suzuki et al teaches a method to improve the affinity between the lubricating film and the DLC film, and the selection of something based on its known suitability for its intended use has been held to support a prima facie case of obviousness.

Applicants respectfully submit that, despite this logic, the simple conclusion is that the limitations of claim 1, as noted above, are not found in any of Sakaguchi et al, Veerasamy et al

or Suzuki et al. Thus, neither of claim 1 or claim 3 is anticipated or rendered obvious by the cited art.

Claim 4

With specific regard to Claim 4, which contains all the limitations of Claim 3, the Examiner asserts that the combination the three references, teach all the limitations of Claims 1, 3 and 4. as already demonstrated, none of the three references nor the knowledge of one skilled in the art discloses or suggests the claimed invention.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

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Respectfully submitted,

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